

# Impact of Neighborhood Environment on Risk of Obesity and Insulin Resistance

**Environmental factors** such as distance to **parks**, availability of **walking** routes in the neighborhood, and **neighborhood safety** are associated with risk of **obesity and insulin resistance**.

## General Information

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<b>Broad Focus Area</b>	Obesity and altered physical development
<b>Background and Justification</b>	<p>The “built environment” comprises urban design, land use, and the transportation system, and encompasses patterns of human activity within the physical environment.<sup>1</sup> The relation between the built environment, physical activity, and risk of obesity and insulin resistance needs further investigation.<sup>1</sup> Factors that would enhance the assessment of the built environment in relation to physical activity and overweight are improved conceptual and statistical models, improved measures of aspects of the built environment that influence physical activity, and improved assessment of physical activity, relative to earlier work in the field. Improvement of measures of aspects of the built environment that influence physical activities relies in part on better identification of the relevant aspects of the built environment. Traditional measures of the built environment include density of people or jobs per unit area, land use mix, connectivity of streets, street scale, aesthetic qualities, and regional structure.<sup>1</sup> An improved understanding of the attributes of the built environment that influence physical activity and overweight will assist planners in the design and management of the built environment to promote public health.</p>
<b>Prevalence/ Incidence</b>	<p>The prevalence of overweight among children is greater than 16% among children aged 6 years or more, and this prevalence has increased over the past 40 years.<sup>2,3</sup> Being overweight as a child is a risk factor for being overweight in adulthood,<sup>4</sup> and is associated with increased risk of type 2 diabetes, hypertension, and coronary artery disease.<sup>5</sup> Furthermore, being overweight as a child increases the risk of developing type 2 diabetes before the age of 21 years.<sup>6</sup></p>
<b>Economic Impact</b>	<p>Because child overweight is a risk factor for adult overweight, child overweight contributes to the more than \$40 billion annual cost of obesity in the United States.<sup>7</sup></p>

Exposure Measures		Outcome Measures	
<b>Primary/ Child</b>	Neighborhood characteristics (parks, walking paths, crime rates, etc.)	<b>Primary/ Child</b>	<u>Insulin resistance:</u> - Serum insulin levels, Glucose levels, HgbA1C <u>Obesity:</u> - IGF - Body size and habitus - Body composition
Methods	Interview; Questionnaire; Census data; other extant data sets	Methods	Blood sample, Physical exam anthropometry, body composition
Life Stage	Prenatal & Years 1, 2, 5, 10, 15, 20	Life Stage	Birth & periodic

Important Confounders/Covariates	
Lipid profile	Increased lipid levels are associated with an increased risk of insulin resistance <sup>8</sup>
Glucokinase mutation	Glucokinase mutation is associated with increased risk of maturity onset diabetes of the young (MODY) <sup>9</sup>
Hormone levels such as cortisol, growth hormone, insulin-like growth factors	Elevated levels of these and other hormones are associated with obesity and insulin resistance in children <sup>10</sup>
Genetic markers for obesity	Certain genetic markers increase risk of obesity
Parents' body mass indices	BMI and obesity are associated with certain genetic markers. <sup>11</sup>
Family history of diabetes and obesity	A family history of diabetes and obesity increases child's risk. <sup>12, 11</sup>
Lifestyle factors	Less active lifestyles would increase risk of obesity and insulin resistance. <sup>6</sup>
Nutrition	Poor nutritional and high caloric diet would increase risk of obesity and insulin resistance <sup>13</sup>
Socio-economic status and demographics	Children of lower economic status, ethnic and racial groups (particularly Native Americans, Hispanics, African Americans, and Asians) are at higher risk of obesity and insulin resistance. <sup>12</sup>

Population of Interest	Estimated Effect that is Detectable
All children.	As an example power calculation for this hypothesis, the smallest detectable relative risk for metabolic syndrome in relation to the presence of sidewalks in one's neighborhood (about 40% of people in the U.S. do not have sidewalks in their neighborhood) <sup>14</sup> is approximately 1.4.

Other Design Issues	
Ethical/Burden Considerations	Direct visual assessment of the neighborhood by study personnel would reduce burden on the participants. Blood studies, especially fasting, in younger children will require careful attention. Obtaining consent for the use of DNA may be an issue.
Cost/Complexity of Data Collection	Addressing this hypothesis based on obesity and insulin resistance measures at later life-stages may be adversely impacted by attrition of study subjects.
Need for Community Involvement	Daycare and school cooperation may be required for some of the intended measures.

### References:

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<sup>12</sup> Fact Sheet: SEARCH for Diabetes in Youth. CDC: Department of Health and Human Services  
<http://www.cdc.gov/diabetes/pubs/factsheets/search.htm>

<sup>13</sup> Ogden CL, Flegal KM, et al. Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA.* 9 Oct 2002; 288(14): 1728-32.

<sup>14</sup> Brownson RC, Baker EA, Housemann RA, Brennan LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. *Am J Public Health.* 2001 Dec;91(12):1995-2003.

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